Transformational Cost Reduction for Airborne Internet

Airborne Internet Objective

To Enable A Safer, More Secure, More Cost Efficient NAS
By Eliminating Communications As A Constraint
On The Economic Viability Of Aviation Related Applications

- VERY LOW COST
- VERY HIGH SPEED
- SCALEABLE
- UBIQUITOUS
- SECURE
- OPEN
- EVOLUTIONARY

WE WANT TO HAVE THE SAME EFFECT ON AVIATION COMMUNICATIONS THAT THE TRANSITION FROM COPPER WIRE TO FIBEROPTIC CABLE HAD ON TERRESTRIAL COMMUNICATIONS

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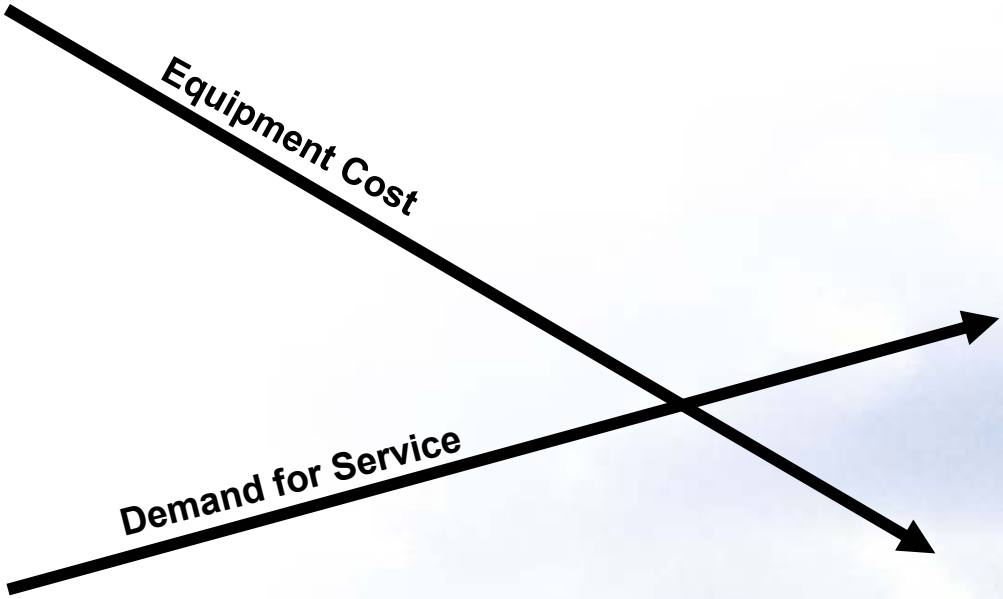
Why Now?



Airlines: “If it increases costs we don’t want it”

Demand Trend driven by Analog to Digital Migration

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- Macro trend toward digital migration well underway.
  - 50% of internet households express interest in VOIP
  - Converged data, voice and video
- Global analog Architecture and Infrastructure are migrating to a system that is digital and capable of IP
- Generation Y is going to experience communications in a way we never could have imagined.
  - New hybrid devices
- Over 50 Million households have broadband service.
  - Adoption rate is nearly 2.5 million/month and accelerating.
- Open architecture and software based application systems enable networks that are cheaper to evolve and upgrade.
  - True for aviation as well as terrestrial

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Revenue Source

CNN.com QUICKVOTE

Created: Wednesday, April 21, 2004, at 01:37:04 EDT

Will you use the Internet in-flight?

Yes, but only if it is free	79%	4244 votes
Yes, even if I have to pay	13%	701 votes
No	8%	436 votes
	Total:	5381 votes

This QuickVote is not scientific and reflects the opinions of only those Internet users who have chosen to participate. The results cannot be assumed to represent the opinions of Internet users in general, nor the public as a whole. The QuickVote sponsor is not responsible for content, functionality or the opinions expressed therein.

The key is to design a system that can profitably provide Airborne Internet access based upon revenue from this user group. Why? -- Because they represent a new revenue source, not a cost to the airline or the government.

Price Performance Objective

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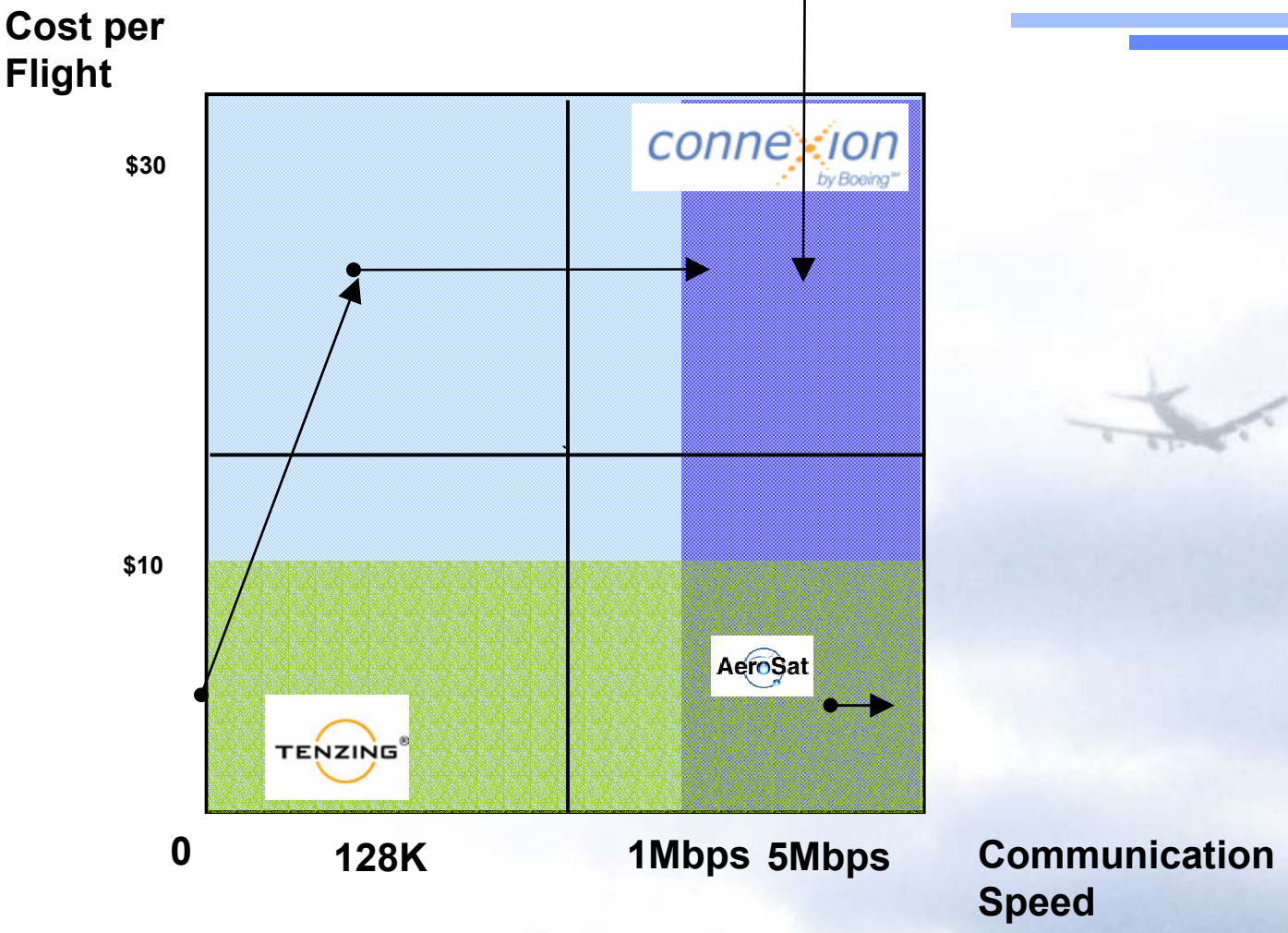

Internet to Aircraft

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Aircell
Airshow
Air TV
AeroSat
ARINC
AT&T Wireless
Boeing Connexion
Honeywell
ICO Global
In Flight Network
Inflightonline Inc.
INMARSAT
LiveTV
NewsCorp
Teledesic
Tenzing
Thompson

Technical feasibility is not the issue

Data can be moved to aircraft

- **At high speed**
- **With ubiquitous coverage**
- **At low cost**

But not all three in a single solution

Airborne Internet Requires a System of Systems

AeroSat

Lowering the Average Cost Increasing the Average Speed

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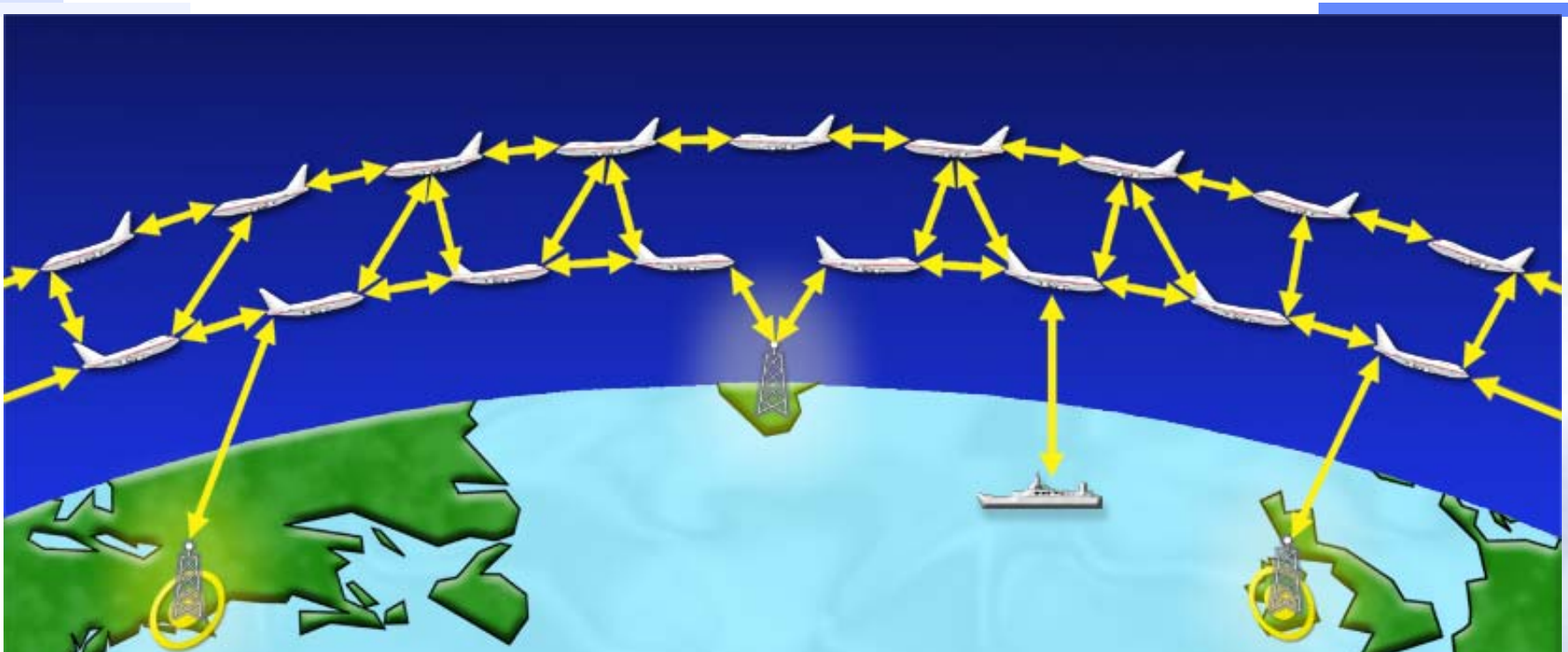

- Broadband communications over 1000 times as fast as standard 64K satellite service, operating at a small fraction of the cost.

- Uses the aircraft to carry the signals…
  …forgoing all the costs associated with satellites.

Capabilities and Applications…

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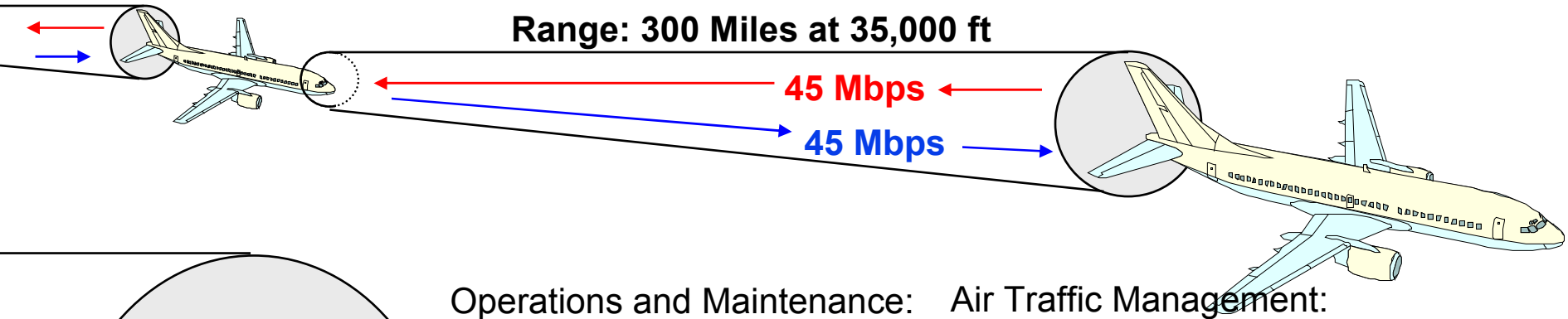


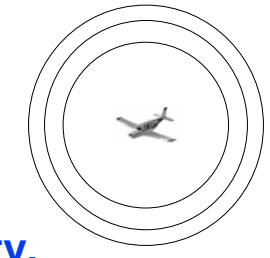
Applications

Operations and Maintenance:
- Engine Monitoring
- Crew Communications
- Fault Reporting
- Diversion Management

Cabin Services:
- Internet Access
- Programming Distribution

Air Traffic Management:
- System Capacity
- Hazardous Weather Avoidance
- Collaborative Decision Making
- Conformance Monitoring

Safety & Security:
- Transportation Security
- Real Time Black Box Transmission
- Telemedicine



Decision making requires real-time information…

…real-time information requires connectivity.

AeroSat

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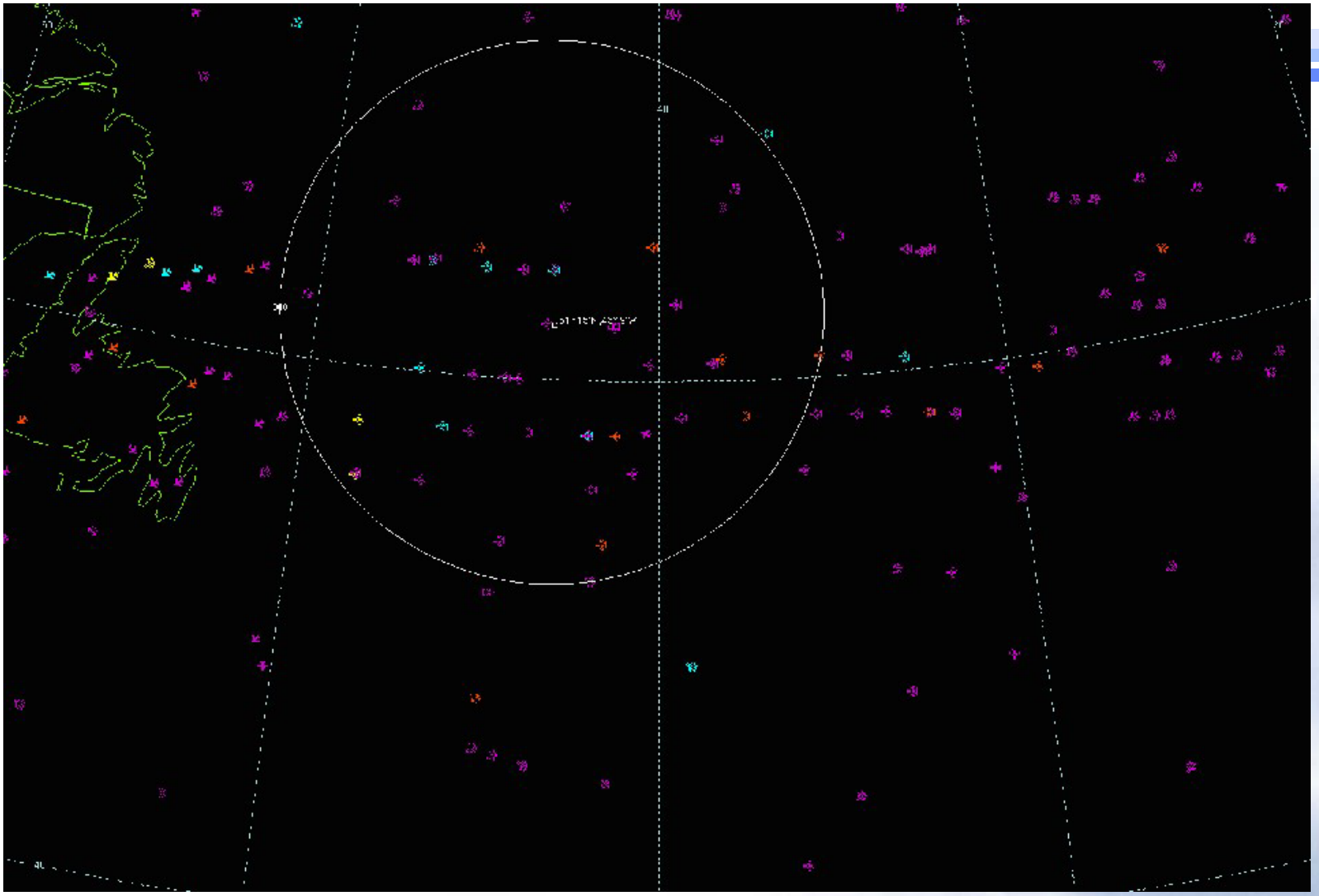
North Atlantic Traffic Density



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Network Formation over the U.S.

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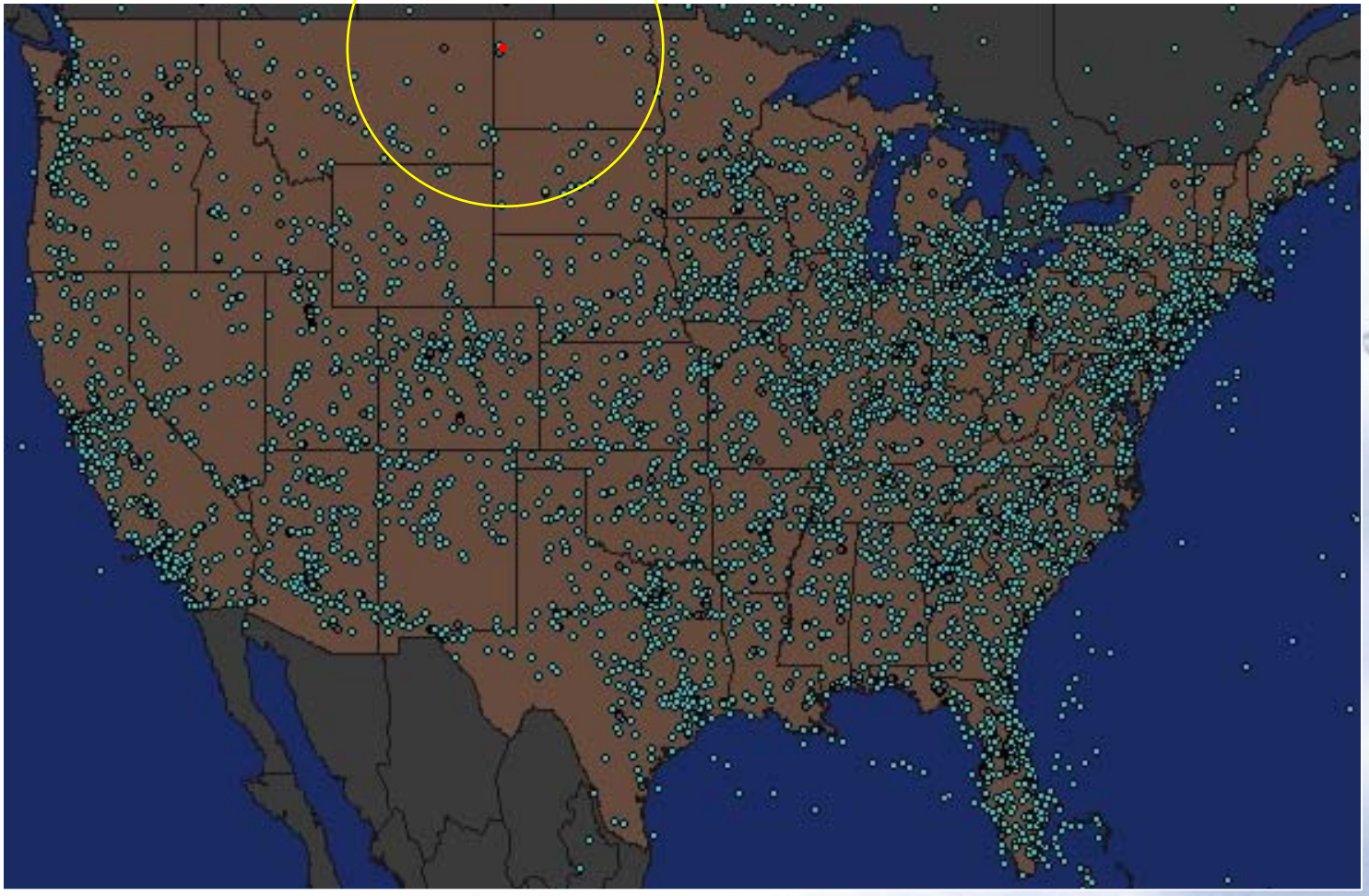

Oceanic Surveillance and Real-time Direct Communications

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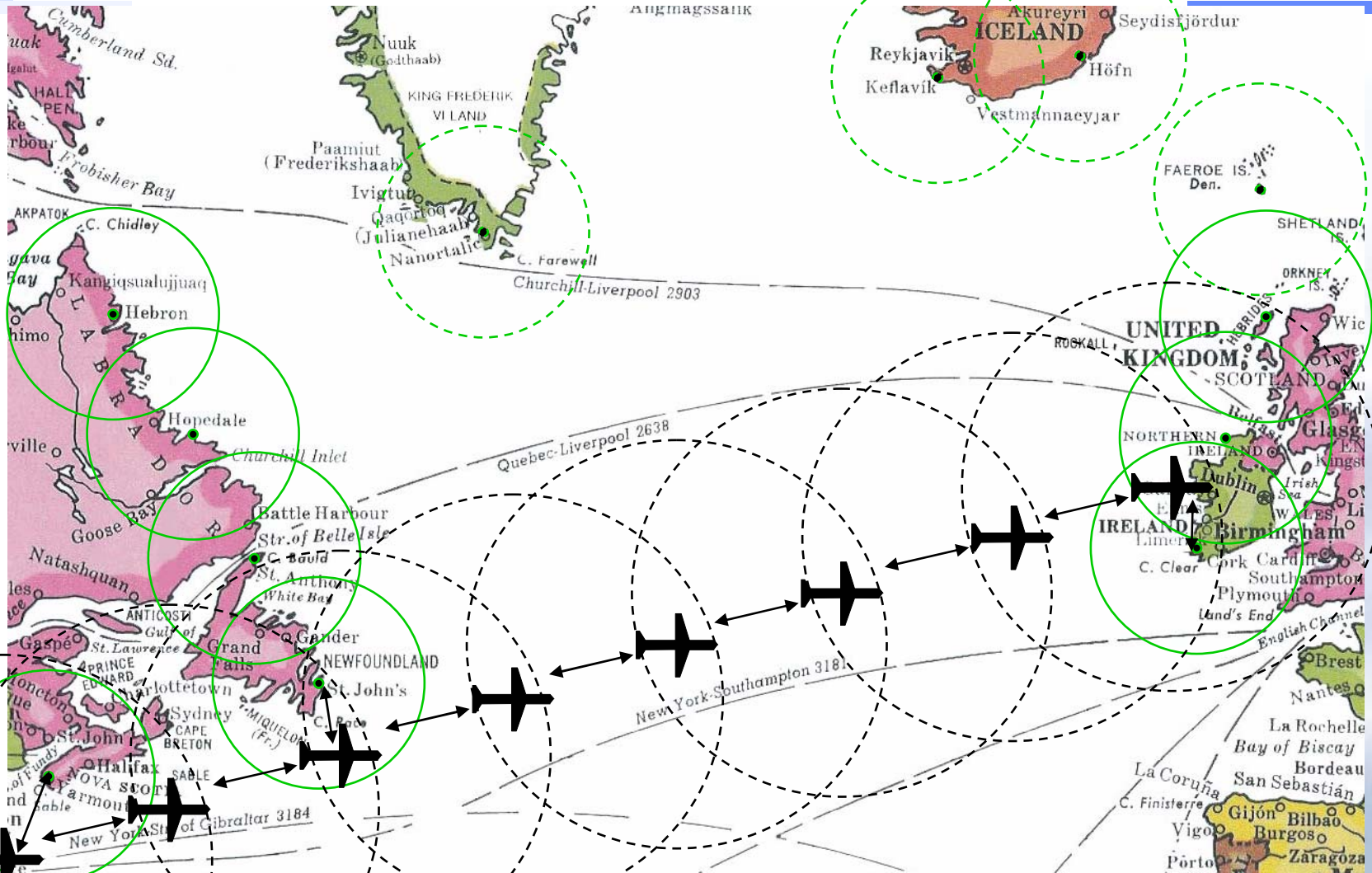

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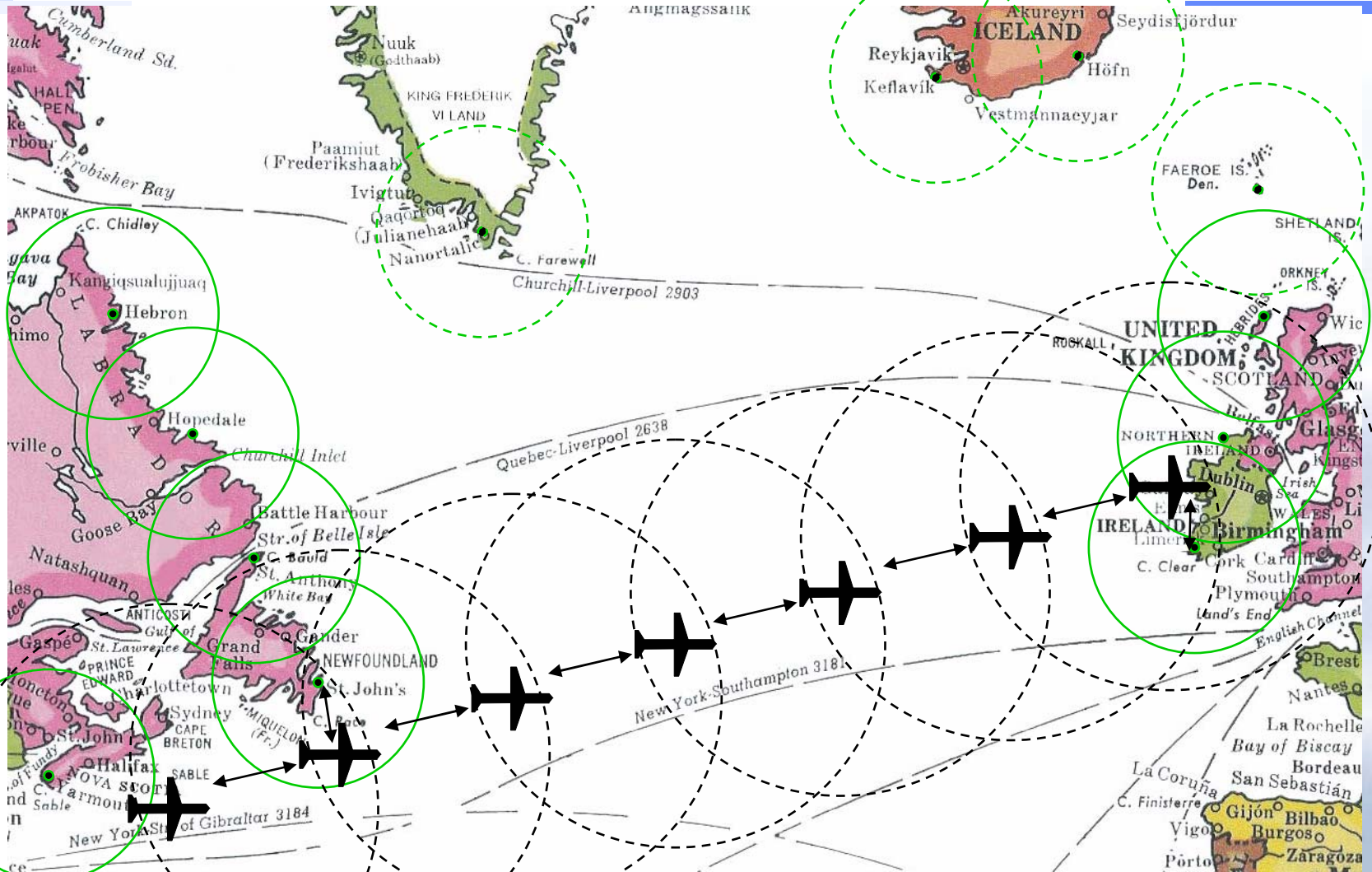

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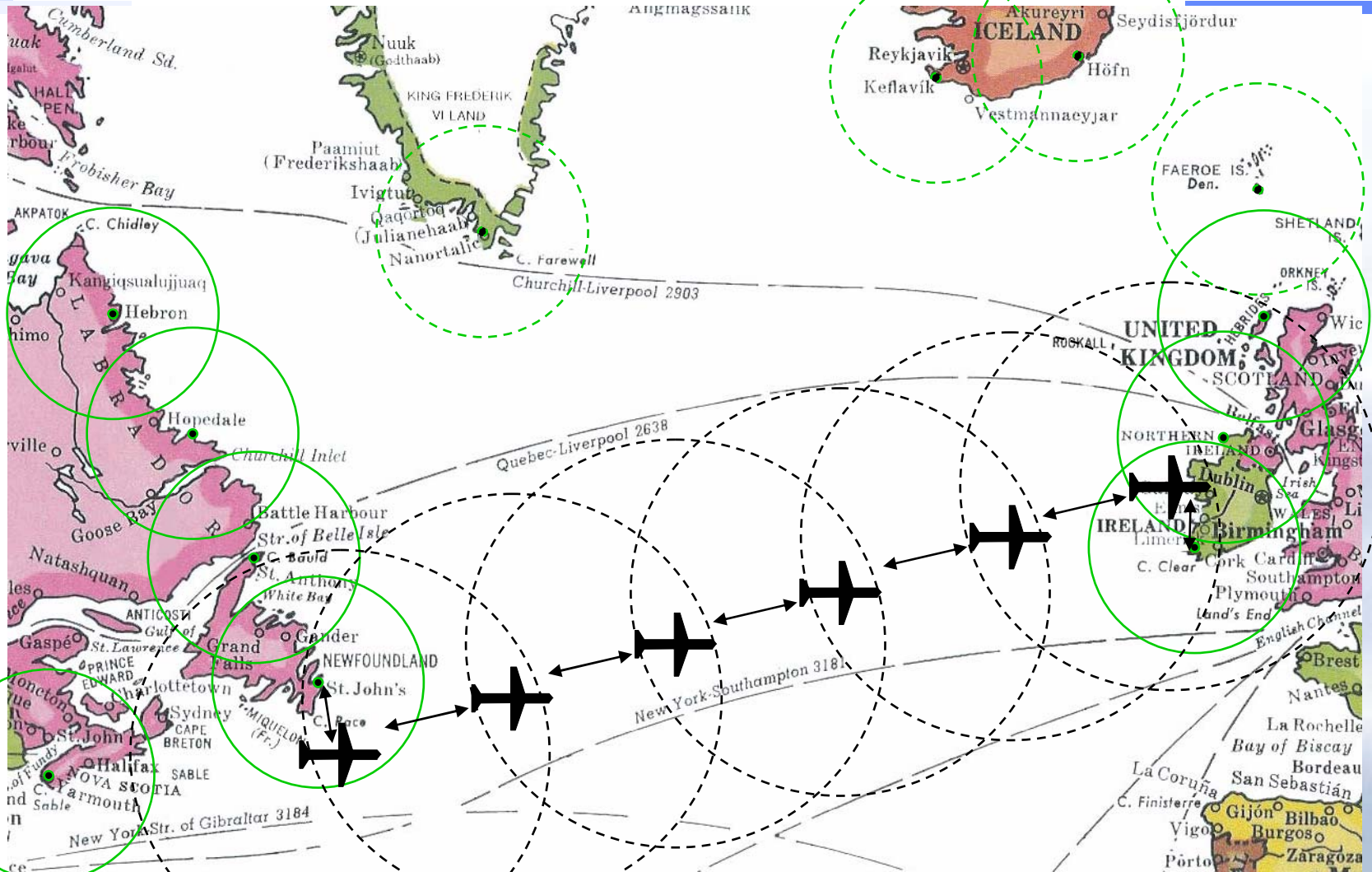

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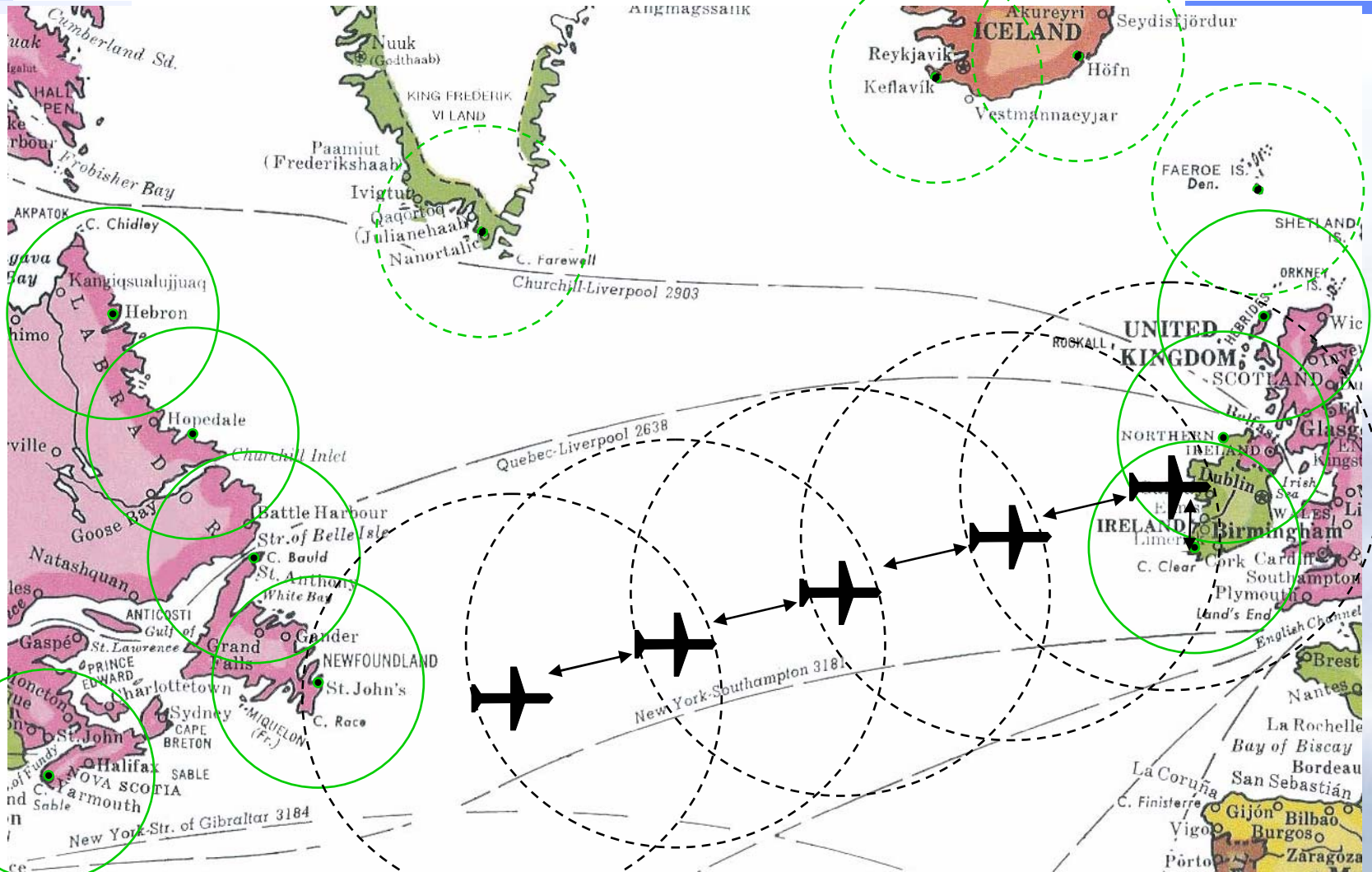

System Characteristics

45 Mbps full duplex trunk daisy chained between aircraft (node) and ground back haul connection (access point) stations

150 Nautical mile range from A/C to access point*

300 Nautical mile range A/C to A/C*

10^{-8} Bit error rate

Maximum Frequency Reuse

- Directional transmission
- Power managed

System establishes and maintains autonomous radio links connectivity

- Provides automatic adjustment of link as aircraft enter and egress pathways/network
- Provides link physical optimization based on aircraft field-of-view to ground sites and other aircraft

Mechanism for late net entry

- Aircraft requests entry into network

Network protocol based on IP over ATM

- Aircraft flying at 35,000 feet (230 Nautical mile line-of-sight to ground)

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The Demonstration

AeroSat Corporation, a New Hampshire based company, has commenced work on a project to demonstrate a novel low-cost, broadband, non-satellite communications methodology for aircraft.

Under this project we will:

- Model the network and run a detailed simulation with real world data.
- Optimize the system configuration for the number of backbone alternatives established.
- Configure hardware and equip three aircraft and one ground station to establish a broadband backbone and extend it beyond the line of sight.
- Collaborate with the FAA William J. Hughes Technical Center in Atlantic City New Jersey, who will fly the hardware and participate in data collection and analysis.

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